federal register

Monday
July 14, 1980

Part V

Department of Energy

Office of Energy Conservation and Solar Energy

Energy Conservation Program for Consumer Products; Proposed Test Procedures for Electric Refrigerators, Electric Refrigerator-Freezers, and Freezers

DEPARTMENT OF ENERGY

Office of Energy Conservation and Solar Energy

10 CFR Part 430

[Docket No. CAS-RM-80-118]

Energy Conservation Program for Consumer Products; Proposed Rulemaking and Public Hearing Regarding Test Procedures for Electric Refrigerators, Electric Refrigerator-Freezers, and Freezers

AGENCY: Department of Energy.

ACTION: Proposed rule.

SUMMARY: The Department of Energy hereby proposes to amend its test procedures for refrigerators, refrigerator-freezers, and freezers. These test procedures are part of the energy conservation program for consumer products established pursuant to the Energy Policy and Conservation Act, as amended by the National Energy Conservation Policy Act. Among other program elements, the legislation requires that standard methods of testing be prescribed for covered products.

DATES: Written comments in response to this notice by September 12, 1980; requests to speak by Aug. 21, 1980; statements by Sept. 5, 1980; public hearing to be held on Sept. 9, 1980. Speakers to be notified by Aug. 27, 1980.

ADDRESSES: Public hearing to be held at: Room 3000A Federal Building, Department of Energy, 12th and Pennsyvlania Avenue, N.W., Washington, D.C.

Comments, requests to speak at the hearing and statements to: Ms. C. Snipes, U.S. Department of Energy, Office of Conservation and Solar Energy, Hearings and Dockets, Mail Stop 6B-025, 1000 Independence Ave., S.W., Washington, D.C. 20585.

FOR FURTHER INFORMATION CONTACT:

James A. Smith, U.S. Department of Energy, Office of Conservation and Solar Energy, Division of Buildings and Community Systems, Consumer Products Efficiency Branch, Room GH-065, Mail Station 6B-025, 1000 Independence Ave. S.W., Washington, D.C. 20585, (202) 252-9127.

Carol A. Snipes (Hearing Procedures), U.S. Department of Energy, Office of Conservation and Solar Energy, Office f Hearings and Dockets, Mail Station 6B-025, 1000 Independence Avenue, S.W., Washington, D.C. 20585, (202) 252-9319.

Eugene Margolis, Esq., U.S. Department of Energy, Office of General Counsel, Room 1E-254, Mail Station 6A-152, 1000 Independence Avenue, S.W., Washington, D.C. 20585, (202) 252-9510.

SUPPLEMENTARY INFORMATION:

A. Background

On October 1, 1977, the Department of Energy (DOE) assumed the authority of the Federal Energy Administration (FEA) for the energy conservation program for consumer products, under Section 301 of the Department of Energy Organization Act (DOE Act) (Pub. L. 95-91). The energy conservation program for consumer products was established by FEA pursuant to Title III, Part B of the Energy Policy and Conservation Act (Act) (Pub. L. 94-163). Subsequently, the Act was amended by the National Energy Conservation Policy Act (NECPA) (Pub. L. 95-619). References in this notice to "the Act", or to sections of the Act, refer to the Energy Policy and Conservation Act as amended by NECPA. Section 323 (42 U.S.C. 6293) of the Act requires that standard methods of testing be prescribed for covered products. Test procedures appear at 10 CFR Part 430, Subpart B.

Test procedures were proposed for refrigerators, refrigerator-freezers, and freezers by notice issued April 21, 1977 (42 FR 21576, April 27, 1977) and a public hearing on the proposed test procedures was held on June 14, 1977. Final test procedures were prescribed on September 8, 1977 (42 FR 46140, September 14, 1977).

Subsequently, a Petition for Rulemaking was submitted by the Association of Home Applicance Manufacturers (AHAM). This petition requested that DOE examine shortened test procedures for electric refrigerators, refrigerator-freezers, and freezers. AHAM stated that its alternate test procedures were much less burdensome and would give results that would differ by less than four percent from those obtained under the existing DOE test procedures. The National Bureau of Standards (NBS) has evaluated experimentally the test procedures suggested by AHAM along with other comments received directly from manufacturers and has recommended to DOE revised test procedures which incorporate many of the AHAM suggestions. On the basis of this evaluation and recommendation by NBS, DOE is today proposing to amend the test procedures for electric refrigerators, refrigerator-freezers, and freezers as discussed below.

B. Discussion

(1) AHAM Petition (Single Control Refrigerators, Refrigerator-Freezers, and Freezers)

The current DOE test procedures for refrigerators, refrigerator-freezers, and freezers with single temperature control devices specify that the units be tested for energy consumption at the warmest, midpoint, and coldest temperature positions of the control. After plotting an energy consumption vs. compartment temperature curve corresponding to these control positions, the energy consumption for the standardized freezer compartment temperatures (0° F for freezers, 5° F for refrigerator-freezers, and 15° F for refrigerators) is read from the graph. AHAM proposed than an alternate test procedure be allowed which requires that the control be set such that energy consumption is measured at two rather than three freezer compartment temperatures. One test is conducted by selecting a temperature control position such that the freezer compartment falls within 3° F above the standardized freezer compartment temperature. The other test is conducted with the freezer temperature within 3° F below the standardized freezer compartment temperature. These freezer temperatures and energy consumption values are plotted and are connected by straight lines. The energy consumption of the unit at the standardized freezer compartment temperature (either 0°, 5°, or 15° F, depending upon the class of product) is obtained from the graph.

NBS and DOE have analyzed this test procedure and have determined that a test which requires such careful selection of control positions could potentially be as burdensome as the existing procedure which requires three test points. Any data taken when temperatures differ by more than 3°F from the specified temperature would have to be discarded and the test would have to be repeated with different control settings. This difficulty would be most prevalent when independent laboratory technicians would have to guess correct control settings on products whose control characteristics were unfamiliar to them.

The test procedure proposed today for single control refrigeration products will never require more than two control settings for a valid test. The procedure requires that the energy consumption first be measured with the control set at the midpoint of the control range and that a second energy consumption value be measured with the control set either at the warmest or the coldest setting so that whenever possible, the freezer

compartment temperatures bracket (i.e., one is above and one is below) the standardized freezer compartment temperature. Energy consumption values are plotted vs. freezer temperature and the data points are connected by a straight line. The energy consumption of the test unit at the standardized freezer compartment temperature may be obtained from the graph.

(2) AHAM Petition (Multiple Control Refrigerator-Freezers)

The existing DOE test procedure specifies that multiple control refrigerator-freezers be tested at each of the extreme positions of the controls (warm/warm, warm/cold, cold/warm, cold/cold) and that the energy consumption and freezer compartment temperature be plotted vs. fresh food compartment temperature. These points are connected by straight lines to form envelopes. Test unit energy consumption is reported as the average of the two energy consumption values read from the graph at the 5° F freezer compartment temperature. These tests are carried out with the freezer loaded to 75% of its capacity with frozen food packages.

AHAM proposed that multiple control frost-free refrigerator-freezers by allowed to be tested for energy consumption under the following conditions:

a. No load in the freezer compartment.

b. Freezer compartment temperatures measured with weighted thermocouples as specified in ANSI B38.1–1970.

c. Freezer compartment thermocouples located in positions that would normally be occupied by the thermocoupled test packages.

d. After thermal stabilization has been achieved, energy consumption is measured from the time the compressor begins operating after defrost to the similar time in the next defrost cycle with each control set at the midpoint of its range (m/m). If the midpoint control positions (m/m) result in an average freezer compartment temperature greater than 5°F, the primary and secondary controls are reset to their coldest positions (c/c). If the midpoint control positions (m/m) result in an average freezer compartment temperature less than 5°F, the primary and secondary controls are reset at their warmest positions (w/w).

The resulting temperature and energy consumption values are plotted and the energy consumption of the unit is determined at the 5°F average freezer compartment temperature.

NBS carefully analyzed all four conditions of the AHAM-suggested procedure. The provision for no load in the freezer is a change from the present test procedure which specifies no load in the fresh food compartment and a 75% freezer compartment load of standard sized packages of frozen food. The change was requested by industry to reduce the burdensomeness of the test related to selecting and maintaining the packages, constantly relocating them, arranging them in the freezer compartment under test, and assuring that the imbedded thermocouples are correctly positioned. The load increases the length of time a test takes since a large thermal mass requires considerable time to reach equilibrium conditions. Industry has submitted data which shows that there is no appreciable difference in the results of tests with and without a load. The Canadian Standards Association has long been testing without a freezer compartment load and has obtained results equivalent to those from the current DOE test procedure. NBS ran tests on refrigerator-freezers both with and without loads to assure the acceptability of the proposal. The NBS tests showed that as the load is presently specified, many different load arrangements can result when the same refrigerator freezer compartment is loaded, unloaded, then reloaded several times. The exact placement of each package cannot be specified. Thus, the placement of the first food packages affects the final arrangement of the remaining packages, the location of the thermocouples, and the total number of packages finally placed in the compartment. Consequently, the specified 75% load is actually a variable.

NBS has also found that air circulation around the packages is a very important parameter. An air gap of ½ to 1½ inches (1.5 to 4 cm) between the packages and the freezer walls is specified and the use of insulating spacers is permitted to maintain this gap. Even with spacers, it is very difficult to arrange the load packages in a manner such that the gap is maintained. Also, normal vibrations such as those caused by the compressor motor starting and stopping can cause the food packages to shift position and the air gap to change. NBS concluded that tests with and without a load in the freezer compartment produced essentially the same test results when the load was arranged according to specifications. Blocking of any of the air gaps effects the results by producing different energy usage figures. The elimination of the test load should reduce not only burdensomeness but should also provide a much more standardized and repeatable test. Consequently, today's proposed rule does not require a load in the freezer compartment of automatic defrost refrigerator-freezers.

Since the proposed test procedure does not require a freezer compartment load for certain refrigerator-freezers, the existing method of measuring freezer compartment temperature must be modified since the temperature sensors are specified to be located in the load packages. AHAM requested that freezer temperatures be measured in accordance with an existing industry method in which a thermal mass (with a heat capacity not to exceed that of 20 grams of water) is attached to the temperature sensor. These sensors are then located in the freezer compartment in the positions previously occupied by the instrumented frozen food packages. NBS has determined that the thermal mass of 20 grams could be obtained with a small container of water (less than an ounce), a large volume of foam insulation, a metal sphere or a large thin sheet of metal, etc. The physical dimensions of the thermal mass can affect the measured compartment temperature, particularly in the freezer compartment. A thermal mass is desirable on temperature sensors in the freezer section because of the large cyclic temperature variation and sharp changes which make temperature averaging difficult. Today's proposed rule requires the use of weighted temperature sensors and specifies the thermal mass dimensionally, in order to reduce differences due to (1) the effects of the thermal mass on the air circulation in the compartment, (2) the locations of the sensors, and (3) the variation of measured temperatures. The metallic material used and its thermal mass are not critical since neither actually affect the average temperature measured. Therefore, a broad dimensional tolerance is permitted and any metal material is allowed.

The revised control settings suggested by AHAM (testing at the mid/mid and then either cold/cold or warm/warm positions), which reduce the refrigerator-freezer test procedure from a four-point test to a two-point test, were evaluated by NBS. NBS confirmed that these control settings, in combination with no load in the freezer, did give test results which varied no more than 4 percent from the existing test procedure. Part of this variation may be due to inaccuracies in selecting the mid/mid position on controls that have widely separated control setting markings and those with an even number of control markings such that none of the marks is at the actual center position. Some of

these controls also have detents and large differences in control settings can result by selecting a position (detent) on either side of the midpoint. Consequently, today's proposed rule includes the AHAM-suggested two-point test but requires that the controls be set at the midpoints even if detents have to be mechanically overridden.

(3) Another Two-Point Test Procedure

One industry member submitted data to NBS which indicated that a two-point test procedure using the cold/cold and warm/warm settings rather than a mid/mid setting would produce more consistent results with less deviation from test to test. While this conclusion may be true for this manufacturer, it may not hold true for all manufacturers. The use of extreme positions can produce erroneous results if the efficiency of the unit tested varies noticeably with the duration of compressor operating cycles. Consequently, this test procedure was not included in the proposed rule.

(4) All-Refrigerator

A new refrigeration product, which the present test procedures do not adequately evaluate, is now available in the marketplace. The "all-refrigerator" has a very small freezer compartment for frozen loads and is not designed to maintain temperatures much below the 32°F temperature needed to make the store ice cubes. Today's proposed rule contains a definition of the "all-refrigerator" which specifies that its freezer compartment can be no larger than 0.25 cubic feet. Since the freezer temperature of an all-refrigerator is not a critical parameter, a new test procedure is proposed which calculates energy consumption for this product based upon the temperature of the fresh food compartment. This calculation procedure employs two formulas. One formula determines the per-cycle energy use at 38.0°F (3.3.°C) in the fresh food compartment by selecting this point on the energy consumption curve defined by the two test data points. When the temperature control cannot be set to attain a fresh food compartment temperature at or above 38.0°F (3.3.°C), the other formula is used to select the minimum test energy use as the per-cycle energy consumption.

(5) NonTime-Initiated (Demand) Defrost

At the present time, there are no refrigeration products on the market which initiate automatic defrosting of the freezer by measuring any parameter other than compressor run time. The technology to produce such a system is presently available. This technique is often called demand defrost and its use could reduce the amount of energy consumed by automatic defrost refrigeration products.

A test procedure for non-time-initiated defrost products is included in today's proposed rule and would be applicable to such a system when it appears on the market. This test procedure consists of two parts. The first part is the same as a nonautomatic defrost test and is used to determine the steady state energy use of a unit when not defrosting. The second part measures the energy of a defrost period and requires a manual initiation of defrost while the compressor motor is running. The energy use during defrost is measured from initiation until the completion of the second cycle of the compressor motor after defrost to include the most significant part of the energy consumption during the stabilization period after defrost. The manual defrost initiation is necessary since there is insufficient frost build-up during a no-load closed door test to cause an automatic initiation. If an attempt were made to cause frost build-up by using a water load in the fresh food or freezer compartment, the defrost energy would be artificially high (higher than for time-initiated defrost) since energy would be required to melt the frost. For time-initiated defrost systems, the existing test procedure measures the energy used to defrost a unit which has little accumulated frost and has been correlated to actual field use experience. A similar test without frost on the coil should also correlate for non-time-initiated defrost systems. The accurate calculation of energy consumption of demand defrost products requires knowledge of the average time between defrosts. Since demand defrost products currently are not marketed, the data is not available. Demand defrost frequency will vary depending upon the average amount of moisture input to the cabinet from the ambient air introduced by door openings and from moisture released by food items placed in the refrigerator-freezer. The moisture input due to food load will vary with the design of the product depending upon the amount of air circulation between the fresh food and freezer compartments. Based upon information published by a defrost control manufacturer, NBS has recommended that the proposed test procedure assume that demand defrosts occur once every 24 hours. Manufacturers are specifically invited to comment on this aspect of the proposed test procedure. When demand defrost products appear on the market, it is possible that the average frequency of defrost will differ from the 24 hour interval which is assumed by the test procedure. If manufacturers can substantiate the average defrost intervals for their products, DOE will consider modifying the test procedure calculations to utilize the more accurate information.

(6) Temperature Measurements

Methods of measuring compartment temperatures proposed in today's rule differ slightly from the methods in the existing test procedure. Instead of measuring temperatures on an unspecified number of compressor cycles before defrost, today's rule requires measurements to be made during one to four cycles, depending upon the frequency at which temperatures are measured. The number of temperature cycles measured is proposed to be equal to the time interval (in minutes) between temperature measurements. When averaging a number of measurements of a variable, the deviation to be expected is inversely proportional to the number of measurements taken. Today's proposed rule provides equivalent accuracy for differing frequencies of measurements, while keeping the number of measurements relatively constant.

(7) Per-Cycle Energy Consumption

Equations for calculating the per-cycle energy consumption are included in today's proposed procedure. These equations replace the graphical evaluation process of the present procedure. The equations mathematically determine energy use in exactly the same way as does a graphical procedure. In many cases, industry members already calculate these energy values because the calculated results are more accurate, less time consuming, and easily done with simple computers or calculators. For refrigerators or refrigerator-freezers, the per-cycle energy use is calculated by using one of three formulas described in section 6.2 of Appendix A. If the fresh food compartment temperature cannot be set at or above 45°F (7.2°C) and the freezer compartment cannot be set at or above its standardized temperature (either 5° or 15°F) with any control setting, the first formula selects the lowest actual test-measured energy consumption. In all other cases the per-cycle energy use is calculated using two formulas, one of which determines energy use as if the fresh food compartment were at 45°F and the other which calculates energy use as if the freezer were at its standardized temperature (5° or 15°F). These values may or may not be attainable in a particular test unit. If not attainable, the

formula extends the line passing through the two actual measured conditions so that energy consumption may be calculated for both of these temperatures. The reported value of per-cycle energy consumption is then selected as the higher of the two calculated values. These methods will replace the existing test procedure's graphical treatment of various special cases.

(8) Definitions

Today's proposed rule modifies the definition of "electric refrigerator" to eliminate the overly prescriptive requirement that the unit has "only one exterior door."

In addition, since DOE is not aware of any gas-powered refrigerators or refrigerator-freezers that are distributed to any significant extent in commerce for domestic use in the United States, today's proposed rule revises the definitions of these products to include only appliances powered by single-phase alternating current electric power.

(9) Commercial Standards

A new ANSI/AHAM standard has been approved which incorporates portions of two existing standards (AHAM HRF–2–ECFT and ANS B38.1–1970) which are referenced by the existing DOE test procedure. The differences between the old and new standards are minor and do not affect test procedure results. The standard is used to standardize the test setup and to measure the useful volume of refrigerators, refrigerator-freezers, and freezers. Where applicable, today's revised test procedure refers to the appropriate portion of the new ANSI/AHAM Standard HRF–1–1979.

Under section 301 of the DOE Act, DOE is required to comply with section 32 of the Federal Energy Administration Act of 1974 (FEA Act) (Pub. L. 93–275), as amended by section 9 of the Federal Energy Administration Authorization Act of 1977 (Pub. L. 95–70).

Sections 32 (a) and (b) of the FEA Act provide that:

(a) If any proposed rule by the Administrator contains any commercial standards, or specifically authorizes or requires the use of any such standards, then any general notice of the proposed rulemaking shall:

(1) Identify, by name, the organization which promulgated such standards; and

(2) State whether or not, in the judgment of the Administrator, such organization complied with the requirements of subsection (b) in the promulgation of such standards.

(b) An organization complies with the requirements of this subsection in promulgating any commercial standards if:

(1) It gives interested persons adequate notice of the proposed promulgation of the standards and an opportunity to participate in the promulgation process through the presentation of their views in hearings or meetings which are open to the public;

(2) The membership of the organization at the time of the promulgation of the standards is sufficiently balanced so as to allow for the effective representation of all interested persons;

(3) Before promulgating such standards, it makes available to the public any records or proceedings of the organization, and any documents, letters, memorandums, and materials relation to such standards; and

(4) It has procedures allowing interested persons to:

(A) Obtain a reconsideration of any action taken by the organization relating to the promulgation of such standards, and

(B) Obtain a review of the standards (including a review of the basis or adequacy of such standards).

The findings required of DOE by section 32 of the FEA Act serve to alert the public and DOE to the use and background of commercial standards in a proposed rulemaking and, through the comment and hearing process, allow interested persons to make known their views regarding the appropriateness of the use of those particular commercial standards in that proposed rulemaking. Any negative finding does not reflect a determination by DOE of the advisability of using a particular standard for part of the test procedure regulation.

As noted above, the rulemaking proposed today contains elements of a commercial standard ANSI/AHAM HRF–1–1979, promulgated by two nongovernmental organizations, ANSI and AHAM.

DOE has determined that this standard does not comply with the requirements of section 32(b) because, among other things, it was not developed in a manner which provided for public participation, comment, and review. As required by Section 32(c), DOE will consult with the Attorney General and the Chairman of the Federal Trade Commission concerning the impact of this standard on competition before prescribing final test procedures.

C. Comment Procedure

1. Written Comment

Interested persons are invited to participate in this rulemaking by submitting data, views or arguments with respect to the proposed amendments set forth in this notice.

Comments should be identified on the outside of the envelope and on documents submitted to DOE with the designation "Refrigerators, Refrigerator-freezers, and Freezers—Proposed Test Procedure Revision; Docket No. CAS–RM–80–118." Fifteen copies should be submitted if possible. All comments received by the data specified at the beginning of this notice, and all other relevant information, will be considered by DOE before final action is taken on the proposed regulation. Pursuant to the provisions of 10 CFR 1004.11, any person submitting information which he or she believes to be confidential and exempt by law from public disclosure should submit one complete copy, and fifteen copies from which information claimed to be confidential has been deleted. In accordance with the procedures established at 10 CFR 1004.11, DOE shall make its own determination which regard to any claim that information submitted be exempted from public disclosure.

2. Public Hearing

a. *Request Procedure.* The time and place of the public hearing are indicated at the beginning of this preamble. The hearing will be continued, if necessary, on the following day. DOE invites any person who has an interest in today's proposed rule, or who is a representative of a group or class of persons that has an interest in today's proposed amendments, to make a written request for an opportunity to make an oral presentation. Such a request should be directed to the address indicated at the beginning of this preamble and must be received by the date specified at the beginning of this notice. Such a request may be hand delivered to such address, between the hours of 9:00 a.m. and 5:00 p.m., Monday through Friday. A request should be labeled both on the document and on the envelope "Refrigerators, Refrigerator-freezers, and Freezers—Proposed Test Procedure Revision; Docket No. CAS–RM–80–118."

The person making the request should briefly describe the interest he or she represents (if any), and state why he or she is a proper representative of a group or class of persons that has such an interest. Each person requesting an opportunity for formal comment should give a concise summary of the proposed

oral presentation and a telephone number where he or she may be contacted.

DOE will notify each person selected to appear at the hearing. Each person selected to be heard should submit 15 copies of his statement to the address and by the date given in the beginning of this preamble. In the event any person wishing to testify cannot meet the 15 copy requirement, alternative arrangements can be made with Carol A. Snipes in advance of the hearing by so indicating in the letter requesting an oral presentation, or by calling (202) 252–9319.

b. *Conduct of Hearing.* DOE reserves the right to select the persons to be heard at the hearing, to schedule their respective presentations, and to establish the procedures governing the conduct of the hearing. The length of each presentation may be limited, based on the number of persons requesting to be heard.

A DOE official will be designated to preside at the hearing. This will not be a judicial or evidentiary type hearing. Questions may be asked only by those conducting the hearing, and there will be no cross-examination of persons presenting statements. Any decision made by DOE with respect to the subject matter of the hearing will be based on all information available to DOE. At the conclusion of all initial oral statements, each person who has made an oral statement will be given the opportunity, if he or she so desires, to make a rebuttal statement. The rebuttal statements will be given in the order in which the initial statements were made and will be subject to time limitations.

Any interested person may submit questions to be asked of any person making a statement at the hearing. DOE will determine whether the question is relevant, and whether the time limitations permit it to be presented for answer.

Any further procedural rules needed for the proper conduct of the hearing will be announced by the presiding officer.

A transcript of the hearing will be made and the entire record of the hearing, including the transcript, will be retained by DOE and made available for inspection at the DOE Freedom of Information Office in the Forrestal Building, 1000 Independence Ave., S.W., Room 5B–180, Washington, D.C. 20585, between the hours of 8:30 a.m. and 4:00 p.m., Monday through Friday. In addition, any person may purchase a copy of this transcript from the reporter.

D. Regulatory and Environmental Review

Pursuant to Section 7(a)(1) of the Federal Energy Administration Act of 1974, a copy of this notice has been submitted to the Administrator of the Environmental Protection Agency for his comments concerning the impact of this proposal on the quality of the environment. No comments have been received from the Administrator.

In accordance with the requirements of the National Environmental Policy Act of 1969 (NAPA), 42 U.S.C. 4321 et seq., DOE has evaluated the proposed establishment of these testing procedures for consumer products to determine if an environmental assessment (EA) or an environmental impact statement (EIS) is required. These test procedures will be used only to standardize the measurement of energy usage for the subject consumer products. The action of prescribing these test procedures, by itself, will not result in any environmental impacts. Thus, it is clear that the proposed action is not a major Federal action significantly affecting the quality of the human environment, and neither an EA nor an EIS is required. The potential environmental impacts that might occur from the application of the test procedures in connection with DOE's minimum energy efficiency standards program will be evaluated separately by that program.

The proposed rule has been reviewed in accordance with Executive Order 12044 and DOE Order 2030.1, and it has been determined that the proposal is significant in nature but does not have major impacts to manufacturers and consumers (i.e., would not impose annual economic costs of $100 million or more). Consequently, a regulatory analysis has not been prepared for this proposed rule.

In consideration of the foregoing, it is proposed to amend Chapter II of Title 10, Code of Federal Regulations, as set forth below.

Issued in Washington, D.C., July 9, 1980.

T. E. Stelson,

Assistant Secretary, Conservation and Solar Energy.

PART 430—ENERGY CONSERVATION PROGRAM FOR CONSUMER PRODUCTS

Provisions of 10 CFR Part 430, Subpart B and Appendices A and B are amended as follows:

Subpart B—Test Procedures

1. Section 430.2 definitions of "electric refrigerator," "electric refrigerator-freezer," "freezer," "refrigerator," and "refrigerator-freezer" are revised to read as follows:

§ 430.2 [Amended]

* * * * *

"Electric refrigerator" means a cabinet designed for the refrigerated storage of food at temperatures above 32°F., and having a source of refrigeration requiring single phase, alternating current electric energy input only. An electric refrigerator may include a compartment for the freezing and storage of food at temperatures below 32°F., but does not provide a separate low temperature compartment designed for the freezing of and the long term storage of food at temperatures below 8°F.

* * * * *

"Electric refrigerator-freezer" means a cabinet which consists of two or more compartments with at least one of the compartments designed for the refrigerated storage of foods at temperatures above 32°F. and with at least one of the compartments designed for the freezing of and the storage of frozen foods at temperatures of 8°F. or below which may be adjusted by the user to a temperature of 0°F. or below. The source of refrigeration requires single phase, alternating current electrical energy input only.

* * * * *

"Freezer" means a cabinet designed as a unit for the storage of food at temperatures of 0°F. or below, having the ability to freeze food and having a source of refrigeration requiring single phase, alternating current energy input only.

* * * * *

"Refrigerator" means an electric refrigerator.

* * * * *

"Refrigerator-freezer" means an electric refrigerator-freezer.

2. Section 430.22 paragraphs (a) and (b) are revised to read as follows:

§ 430.22 Test procedures for measures of energy consumption.

(a) *Refrigerators and refrigerator-freezers.* (1) The estimated annual operating cost for electric refrigerators and electric refrigerator-freezers without an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 of

Appendix A of this subpart, and (iii) the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The estimated annual operating cost for electric refrigerators and electric refrigerator-freezers with an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory just prior to shipping, each in kilowatt-hours per cycle, determined according to 6.2 of Appendix A of this subpart, and (iii) the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(3) The estimated annual operating cost for any other specified cycle type for electric refrigerators and electric refrigerator-freezers shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the specified cycle type, determined according to 6.2 of Appendix A to this subpart, and (iii) the representative average unit cost in dollars per kilowatt-hour as provided by the Administrator, the resulting product then being rounded off to the nearest dollar per year.

(4) The energy factor for electric refrigerators and electric refrigerator-freezers, expressed in cubic feet per kilowatt-hour per cycle, shall be—

(i) For electric refrigerators and electric refrigerator-freezers not having an anti-sweat heater switch, the quotient of (A) the adjusted total volume in cubic feet, determined according to 6.1 of Appendix A of this subpart, divided by (B) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 of Appendix A of this subpart, the resulting quotient then being rounded off to the second decimal place, and

(ii) For electric refrigerators and electric refrigerator-freezers having an anti-sweat heater switch, the quotient of (A) the adjusted total volume in cubic feet, determined according to 6.1 of Appendix A of this subpart, divided by (B) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory, each in kilowatt-hours per cycle, determined according to 6.2 of Appendix A of this subpart, the resulting quotient then being rounded off to the second decimal place.

(5) Other useful measures of energy consumption for electric refrigerators and electric refrigerator-freezers shall be those measures of energy consumption for electric refrigerators and electric refrigerator-freezers which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of Appendix A of this subpart.

(b) *Freezers.* (1) The estimated annual operating cost for freezers without an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 of Appendix B of this subpart, and (iii) the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(2) The estimated annual operating cost for freezers with an anti-sweat heater switch shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat heater switch in the position set at the factory, each in kilowatt-hours per cycle, determined according to 6.2 of Appendix B of this subpart, and (iii) the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(3) The estimated annual operating cost for any other specified cycle type for freezers shall be the product of the following three factors: (i) The representative average-use cycle of 365 cycles per year, (ii) the average per-cycle energy consumption for the specified cycle type, determined according to 6.2 of Appendix B of this subpart, and (iii) the representative average unit cost in dollars per kilowatt-hour as provided by the Secretary, the resulting product then being rounded off to the nearest dollar per year.

(4) The energy factor for freezers, expressed in cubic feet per kilowatt-hour per cycle, shall be—

(i) For freezers not having an anti-sweat heater switch, the quotient of (A) the adjusted net refrigerated volume in cubic feet, determined according to 6.1 of Appendix B of this subpart, divided by (B) the average per-cycle energy consumption for the standard cycle in kilowatt-hours per cycle, determined according to 6.2 of Appendix B of this subpart, the resulting quotient then being rounded off to the second decimal place, and

(ii) For freezers having an anti-sweat heater switch, the quotient of (A) the adjusted net refrigerated volume in cubic feet, determined according to 6.1 of Appendix B of this subpart, divided by (B) half the sum of the average per-cycle energy consumption for the standard cycle and the average per-cycle energy consumption for a test cycle type with the anti-sweat switch in the position set at the factory just prior to shipping, each in kilowatt-hours per cycle, determined according to 6.2 of Appendix B of this subpart, the resulting quotient then being rounded off to the second decimal place.

(5) Other useful measures of energy consumption for freezers shall be those measures of energy consumption for freezers which the Secretary determines are likely to assist consumers in making purchasing decisions and which are derived from the application of Appendix B of this subpart.

* * * * *

3. Appendix A is revised to read as follows:

Appendix A—Uniform Test Method for Measuring the Energy Consumption of Electric Refrigerators and Electric Refrigerator-Freezers

1. Definitions

1.1 "HRF–1–1979" means the Association of Home Appliance Manufacturers standard for household refrigerators, combination refrigerator-freezers, and household freezers, also approved as an American National Standard as a revision of ANSI B 38.1–1970.

1.2 "Adjusted total volume" means the sum of (i) the fresh food compartment volume as defined in HRF–1–1979 in cubic feet, and (ii) the product of an adjustment factor and the net freezer compartment volume as defined in HRF–1–1979, in cubic feet.

1.3 "Anti-sweat heater" means a device incorporated into the design of a refrigerator or refrigerator-freezer to prevent the accumulation of moisture on exterior surfaces of the cabinet under conditions of high ambient humidity.

1.4 "All-refrigerator" means an electric refrigerator which does not include a compartment for the storage of frozen food at temperatures below 32°F (0.0°C). It may include a compartment of 0.25 cubic feet (7.1 liters) or less for freezing and storage of ice.

1.5 "Cycle" means the period of 24 hours for which the energy use of an electric

refrigerator or electric refrigerator-freezer is calculated as though the consumer activated compartment temperature controls were set so that the desired compartment temperatures were maintained.

1.6 "Cycle type" means the set of test conditions having the calculated effect of operating an electric refrigerator or electric refrigerator-freezer for a period of 24 hours, with the consumer activated controls other than those that control compartment temperatures set to establish various operating characteristics.

1.7 "Standard cycle" means the cycle type in which the antisweat heater control, when provided, is set in the highest energy consuming position.

1.8 "Automatic defrost" means s system in which the defrost cycle is automatically initiated and terminated, with resumption of normal refrigeration at the conclusion of defrost operation. The system automatically prevents the permanent formation of frost on all refrigerated surfaces. Nominal refrigerated food temperatures are maintained during the operation of the automatic defrost system.

2. Test Conditions

2.1 Operational conditions. The electric refrigerator or electric refrigerator-freezer shall be installed and its operating conditions maintained in accordance with HRF-1-1979, section 7.1 through section 7.4.3.3, except as noted in paragraph 2.3, below.

2.2 Ambient temperature. The ambient temperature of the air surrounding the unit being tested shall be 90.0 ±1°F (32.3 ± 0.6°C) during the time while the unit is stabilizing to steady state conditions and during the test period.

2.3 Conditions for automatic defrost refrigerator-freezers. For automatic defrost refrigerator-freezers, the freezer compartments shall not be loaded with any frozen food packages. Cylindrical metallic masses of dimensions 1.12 ± 0.25 inches (2.9 ± 0.6 cm) in diameter and height shall be attached in good thermal contact with each temperature sensor within the refrigerated compartments. All temperature measuring sensor masses shall be supported by non-thermally conductive supports in such a manner that there will be at least one inch (2.5 cm) of air space separating the thermal mass from contact with any surface. In case of interference with hardware at the sensor locations specified in section 5.1, the sensors shall be placed at the nearest adjacent location such that there will be a one inch air space separating the sensor mass from the hardware.

3. Test Control Settings

3.1 Model with no user operable temperature control. A test shall be performed during which the compartment temperatures and energy use shall be measured. A second test shall be performed with the temperature control electrically short circuited to cause the compressor to run continuously.

3.2 Model with user operable temperature control. A first test shall be performed with all compartment temperature controls set at their median position midway between their warmest and coldest setting. Knob detents shall be mechanically defeated if necessary to attain a median setting. A second test shall be performed with all controls set either at their warmest or their coldest settings, whichever is needed to cause the compartment temperatures measured by the two tests to bracket (i.e., one is above and one is below) the standardized temperature for reporting energy consumption. The standardized temperatures shall be:

3.2.1 All-refrigerator, 36°F (3.8°C) fresh food compartment temperature.

3.2.2 Refrigerator, 15°F (−9.4°C) freezer compartment temperature.

3.2.3 Refrigerator-freezer, 5°F (−15°C) freezer compartment temperature.

If the standardized temperature cannot be attained even with the extreme position setting, the measured temperature at the extreme position shall be as close to the standardized temperature as possible.

4. Test Period

4.1 Test Period. Tests shall be performed by establishing the conditions set forth in Section 2. and using control settings as set forth in Section 3. above.

4.1.1 Nonautomatic Defrost. If no automatic freezer defrost provisions are provided on the model being tested, the test time period shall start after steady state conditions have been reached and be of not less than three hours in duration. During the test period, the compressor motor shall complete two or more whole compressor cycles (a compressor cycle is a complete "on" and a complete "off" period of the motor). If no "off" cycling will occur, the test period shall be three hours. If incomplete cycling (less than two compressor cycles) occurs during a 24 hour period, the results of the 24 hour period shall be used.

4.1.2 Timed Automatic Defrost. If a time-initiated defrost is provided in the device being tested, the test time period shall start after stabilization has been completed and be from one point during a defrost period to the same point during the next defrost period.

4.1.3 Non-Time-Initiated Defrost. If a non-time-initiated defrost system is provided in the model being tested, the test time period shall consist of two parts. A first part shall be the same as the test for a unit having no defrost provisions (section 4.1.1). The second part shall start when a defrost period is manually initiated during a compressor "on" cycle and terminate at the second turn "off" of the compressor motor or after four hours, whichever comes first.

5. Test Measurements

5.1 Temperature Measurements. Temperatures shall be measured at the locations prescribed in Figures 7.1, 7.2, and 7.3 of HRF-1-1979. No freezer temperature measurements need be taken in an all-refrigerator model.

If the interior arrangements of the cabinet do not conform with those shown in Figure 7-1 and 7-2 of HRF-1-1979, measurements shall be taken at selected locations chosen to represent approximately the entire refrigerated compartment. The locations selected shall be a matter of record.

5.1.1 Measured Temperature. The measured temperature of a compartment is to be the average of all sensor temperature readings taken in that compartment at a particular time. Measurements shall be taken at regular intervals not to exceed four minutes.

5.1.2 Compartment Temperature. The compartment temperature for each test period shall be an average of the measured temperatures taken in a compartment during a complete cycle or several complete cycles of the compressor motor (one compressor cycle is one complete motor "on" and one complete motor "off" period). for non-time-initiated defrost models, compartment temperatures shall be those measured in the first part of the test period specified in 4.1.3.

5.1.2.1 The number of compressor motor cycles over which the compartment temperature is to be averaged shall be equal to the number of minutes between measured temperature readings, rounded up to the next whole minute. One of the cycles shall be the last complete compressor motor cycle during the test period.

5.1.2.2 If no compressor motor cycling occurs, the compartment temperatures shall be the average of readings taken during the last thirty minutes of the test period.

5.1.2.3 If incomplete cycling occurs, the compartment temperatures shall be the average of all readings taken during the last three hours of the last complete "on" period.

5.2 Energy Measurements

5.2.1 Per-day Energy Consumption. The energy consumption in kilowatt-hours per day for each test period shall be the energy expended during the test period as specified in section 4.1 adjusted to a 24 hour period. The adjustment shall be determined as follows:

5.2.1.1 Non automatic and time-initiated automatic defrost refrigerators and refrigerator-freezer models. The energy consumption in kilowatt-hours per day shall be calculated as:

$ET = EP \times 1440/T$

where

ET = test cycle energy expended in kilowatt-hours per day,

EP = energy expended in kilowatt-hours during the test period,

T = length of time of the test period in minutes,

1440 = conversion factor to adjust to a 24 hour period in minutes per day.

5.2.1.2 Non-time-initiated defrost. The energy consumption in kilowatt-hours per day shall be calculated as:

$ET = ((EP1/T1) \times (1440-T2)) + EP2$

where

ET = Defined in 5.2.1.1

EP1 = energy expended in kilowatt-hours during the first part of the test,

EP2 = energy expended in kilowatt-hours per day during the second part of the test,

T1 and T2 = length of time in minutes of the first and second test parts respectively, and

1440 = conversion factor to adjust to a 24-hour period.

5.3 Volume measurements. The electric refrigerator or electric refrigerator-freezer total refrigerated volume, VT, shall be measured in accordance with HRF-1-1979, section 3.2 and section 4.1 through 4.3, and defined as:

VT=VF+VFF
where
VT=total refrigerated volume in cubic feet,
VF=freezer compartment volume in cubic feet, and
VFF=fresh food compartment volume in cubic feet.

6. Calculation of Derived Results from Test Measurements

6.1 Adjusted Total Volume.

6.1.1 Electric refrigerators. The adjusted total volume,

VA, for electric refrigerators under test shall be defined as:
VA=(VF×CR)+VFF
where
VA=adjusted total volume in cubic feet,
VF and VFF are defined in 5.3, and
CR=adjustment factor of 1.44, dimensionless.

6.1.2. Electric refrigerator-freezers. The adjusted total volume, VA, for electric refrigerator-freezers under test shall be calculated as follows:
VA=(VF×CRF)+VFF
where
VF and VFF are defined in 5.3 and VA is defined in 6.1.1,
CRF=adjustment factor of 1.63, dimensionless.

6.2 Average Per-Cycle Energy Consumption.

6.2.1 All-refrigerator Models. The average per-cycle energy consumption for a cycle type is expressed in kilowatt-hours per cycle to the nearest tenth (0.1) kilowatt-hour and shall depend upon the temperature attainable in the fresh food compartment as shown below.

6.2.1.1 If the fresh food compartment temperature is always below 38.0°F (3.3°C), the average per-cycle energy consumption shall be defined as:
E=ET1
where
E=Total per-cycle energy in kilowatt-hours per day,
ET is defined in 5.2.1, and Number 1 indicates the test period during which the highest fresh food compartment temperature is measured.

6.2.1.2 If one of the fresh food compartment temperatures measured for a test period is greater than 38.0°F (3.3°C), the average per-cycle energy consumption shall be defined as:
EE=ET1+((ET2−ET1)×(38.0−TR1)/(TR2−TR1)
where
E is defined in 6.2.1.1,
ET is defined in 5.2.1,
TR=Fresh food compartment temperature determined according to 5.1.2 in degrees F,
Number 1 and 2 indicate measurements taken during the first and second test period as appropriate, and
38.0=Standardized fresh food compartment temperature in degrees F.

6.2.2 Refrigerators and refrigerator-freezers. The average per-cycle energy consumption for a cycle type is expressed in kilowatt-hours per-cycle to the nearest tenth (0.1) kilowatt-hour and shall be defined in the applicable following manner:

6.2.2.1 If the fresh food compartment temperature is at or below 45°F (7.2°C) in both of the tests and the freezer compartment temperature is always at or below 15°F (−9.4°C) in both tests of a refrigerator or at or below 5°F (−15°C) in both tests of a refrigerator-freezer, the per-cycle energy consumption shall be:
E=ET1
where
E is defined in 6.2.1.1,
ET is defined in 5.2.1, and
Number 1 indicates the test period during which the highest freezer compartment temperature was measured.

6.2.2.2 If the conditions of 6.2.2.1 do not exist, the per-cycle energy consumption shall be defined by the higher of the two values calculated by the following two formulas:
E=ET1+((ET2−ET1)×(45.0−TR1)/(TR2−TR1))
and
E=ET1+((ET2−ET1)×(k−TF1)/(TF2−TF1))
where
E is defined in 6.2.1.1,
ET is defined in 5.2.1,
TR and number 1 and 2 are defined in 6.2.1.2,
TF=Freezer compartment temperature determined according to 5.1.2 in degrees F,
45.0 is a specified fresh food compartment temperature in degree F, and
k is a constant 15.0 for refrigerators or 5.0 for refrigerator-freezers each being standardized freezer compartment temperature in degrees F.

4. Appendix B is revised to read as follows:

Appendix B—Uniform Test Method for Measuring the Energy Consumption of Freezers

1. Definitions.

1.1 "HRF-1-1979" means the Association of Home Appliance Manufacturers standard for household refrigerators, combination refrigerator-freezers, and household freezers, also approved as an American National Standard as a version of ANSI B38.1-1970.

1.2 "Anti-sweat heater" means a device incorporated into the design of a freezer to prevent the accumulation of moisture on exterior surfaces of the cabinet under conditions of high ambient humidity.

1.3 "Cycle" means the period of 24 hours for which the energy use of a freezer is calculated as though the consumer-activated compartment temperature controls were preset so that the desired compartment temperatures were maintained.

1.4 "Cycle type" means the set of test conditions having the calculated effect of operating a freezer for a period of 24 hours with the consumer-activated controls other than the compartment temperature control set to establish various operating characteristics.

1.5 "Standard cycle" means the cycle type in which the anti-sweat heater switch, when provided, is set in the highest energy consuming position.

1.6 "Adjusted total volume" means the product of, (1) the freezer volume as defined in HRF-1-1979 in cubic feet, times (2) an adjustment factor.

1.7 "Automatic Defrost" means a system in which the defrost cycle is automatically initiated and terminated, with resumption of normal refrigeration at the conclusion of defrost operation. The system automatically prevents the permanent formation of frost on all refrigerated surfaces. Nominal refrigerated food temperatures are maintained during the operation of the automatic defrost system.

2. Test Conditions.

2.1 Operational conditions. The freezer shall be installed and its operating conditions maintained in accordance with HRF-1-1979, section 3.19 and section 7 through section 7.4.3.3.

3. Test Control Settings.

3.1 Model with no user operable temperature control. A test shall be performed during which the compartment temperatures and energy use shall be measured. A second test shall be performed with the temperature control electrically short circuited to cause the compressor to run continuously.

3.2 Model with user operable temperature control. A first test shall be performed with temperature control set at its median position midway between the warmest and coldest setting. A second test shall be performed with the control set either at the warmest or coldest setting whichever is needed to cause the compartment temperatures measured by the two tests to bracket (one above and one below) 0.0° F (—17.8° C). If 0.0° F (—17.8° C) cannot be attained even with the extreme position setting, the measured temperature at the extreme position shall be as close as possible to 0.0° F (—17.8° C).

4. Test Period.

4.1 Test Period. Tests shall be performed by establishing the conditions set forth in Section 2 and using control settings as set forth in Section 3 above.

4.1.1 Nonautomatic Defrost. If no automatic freezer defrost provisions are provided on the model being tested, the test time period shall start after steady state conditions have been reached and be of not less than three hours duration. During the test period the compressor motor shall complete two or more whole cycles (a compressor cycle is a complete "on" and a complete "off" period of the motor). If no "off" cycling will occur the test period shall be three hours. If incomplete cycling (less than two compressor cycles) occurs during a 24 hour period, the results of the 24 hour period shall be used.

4.1.2 Timed Automatic Defrost. If a time-initiated defrost is provided in the device being tested, the test time period shall start after stabilization has been reached and be from one point during a defrost period to the same point during the next defrost period.

4.1.3 Non-Time-Initiated Defrost. If a non-time-initiated defrost system is provided in the model being tested, the test time period shall consist of two parts. A first part shall be the same as the test for a unit having no defrost provisions (section 4.1.1). The second part shall start when a defrost period is manually initiated during a compressor "on" cycle and terminate at the second turn "off" of the compressor motor or after four hours, whichever comes first.

5. Test Measurements.

5.1 Temperature measurements shall be made in accordance with HRF–1–1979 section 7.4.3.3.

5.1.1 Measured Temperature. The measured temperature is to be the average of all sensor temperature readings taken at a particular time. Measurements shall be taken at regular intervals not to exceed four minutes.

5.1.2 Compartment Temperature. The compartment temperature for each test period shall be an average of the measured temperatures taken during a complete cycle or several complete cycles of the compressor motor (one compressor cycle is one complete motor "on" and one complete motor "off" period). For non-time-initiated defrost models, compartment temperatures shall be those measured in the first part of the test period specified in 4.1.3.

5.1.2.1 The number of compressor motor cycles over which the compartment temperature is to be averaged shall be equal to the number of minutes between measured temperature readings rounded up to the next whole minute. One of the cycles shall be the last complete compressor motor cycle during the test period.

5.1.2.2 If no compressor motor cycling occurs, the compartment temperature shall be the average of readings taken during the last thirty minutes of the test period.

5.1.2.3 If incomplete cycling occurs (less than one cycle) the compartment temperature shall be the average of all readings taken during the last three hours of the last complete "on" period.

5.2 Energy Measurements:

5.2.1 Per-day Energy Consumption. The energy consumption in kilowatt-hours per day for each test period shall be the energy expended during the test period as specified in section 4.1 adjusted to a 24 hour period.

The adjustment shall be determined as follows:

5.2.1.1 Nonautomatic and time-initiated automatic defrost models. The energy consumption kilowatt-hours per day shall be calculated as:

$$ET=(EP\times 1440\times k)/T$$

where

ET = test cycle energy expended in kilowatt-hours per day,

EP = energy expended in kilowatt-hours during the test period,

T = length of time of the test period in minutes,

1440 = conversion factor to adjust to a 24 hour period in minutes per day, and

K = correction factor of 0.7 for chest freezers and 0.85 for upright freezers to adjust for average household usage, dimensionless.

5.2.1.3 Non-time-initiated defrost. The energy consumption in kilowatt-hours per day shall be calculated as:

$$ET=(((EP1/T1)\times(1440-T2))+EP2)\times K$$

where

ET, 1440, and K are defined in 5.2.1.1

EP1 = energy expended in kilowatt-hours during the first part of the test,

EP2 = energy expended in kilowatt-hours per day during the second part of the test, and

T1 and T2 = length of time in minutes of the first and second test parts respectively.

5.3 Volume measurements. The electric freezer total refrigerated volume, VT, shall be measured in accordance with HRF–1–1979, section 3.2 and section 5.1 through 5.3.

6. Calculation of Derived Results From Test Measurements.

6.1 Adjusted Total Volume:

6.1.1 Electric freezers. The adjusted total volume, VA, for electric freezers under test shall be defined as:

$$VA=VT\times CF$$

where

VA = adjusted total volume in cubic feet,

VT = total refrigerated volume in cubic feet, and

CF = correction factor of 1.73, dimensionless.

6.2 Average Per-Cycle Energy Consumption:

6.2.1 The average per-cycle energy consumption for a cycle type is expressed in kilowatt-hours per cycle to the nearest tenth (0.1) kilowatt-hour and shall depend upon the temperature attainable in the freezer compartment as shown below.

6.2.1.1 If the freezer compartment temperature is always below 0.0° F (17.8° C), the average per-cycle energy consumption shall be defined as:

$$E=ET1$$

where

E = Total per-cycle energy in kilowatt-hours per day,

ET is defined in 5.2.1, and

Number 1 indicates the test period during which the highest freezer compartment temperature is measured.

6.2.1.2 If one of the freezer compartment temperatures measured for a test period is greater than 0.0° F (17.8° C), the average per-cycle energy consumption shall be defined as:

$$EE=ET1+(ET2-ET1\times(0.0-TF1)/(TF2-TF1))$$

where

E is defined in 6.2.1.1

ET is defined in 5.2.1

TF = Freezer compartment temperature determined according to 5.1.2 in degrees F,

Numbers 1 and 2 indicate measurements taken during the first and second test period as appropriate, and

0.0 = Standardized freezer compartment temperature in degrees F.

[FR Doc. 80–20977 Filed 7–11–80; 8:45 am]

BILLING CODE 6450–01–M